

**HEPATITIS B PREVENTION AND CONTROL: KNOWLEDGE, ATTITUDES AND  
VACCINATION STATUS OF REGISTERED NURSES AT NYANGABGWE HOSPITAL  
IN FRANCISTOWN, BOTSWANA**

by

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submitted in accordance with the requirements

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at the

**UNIVERSITY OF SOUTH AFRICA**

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## DECLARATION

I declare that **HEPATITIS B PREVENTION AND CONTROL: KNOWLEDGE, ATTITUDES AND VACCINATION STATUS OF REGISTERED NURSES AT NYANGABGWE HOSPITAL IN FRANCISTOWN, BOTSWANA** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other education institution.

  
.....  
**SIGNATURE**

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10 January 2019  
.....

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# **HEPATITIS B PREVENTION AND CONTROL: KNOWLEDGE, ATTITUDES AND VACCINATION STATUS OF REGISTERED NURSES AT NYANGABGWE HOSPITAL IN FRANCISTOWN, BOTSWANA**

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## **ABSTRACT**

The study investigated knowledge, attitudes and vaccination status of registered nurses regarding prevention and control of hepatitis B (HB). An analytical, cross-sectional study was conducted, and data was collected using self-administered questionnaires. 53.0% of the respondents (n=219) had good knowledge and 96.3% had positive attitudes regarding HB prevention and control. 86.8% had received at least 1 dose of the HB vaccine, but only 54.7% had received the 3 doses for complete vaccination. A positive attitude score was a significant predictor of HB vaccination uptake (OR=1.424, p=0.003). Female registered nurses were 3.479 times (95% CI: 1.495-8.098; p=0.004) more likely to be vaccinated than male registered nurses. Registered nurses are aware that hepatitis B virus infection can be prevented by a safe and effective vaccine, however, there is need to improve awareness and encourage complete HB vaccination uptake among all registered nurses to ensure their protection against the risk of HBV infection.

## **KEY CONCEPTS**

Attitudes; Botswana; Hepatitis B; knowledge; registered nurses; vaccination status.

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- A big thank you also goes to the registered nurses of Nyangabgwe Hospital whose participation made this study a success.

## ***Dedication***

*I dedicate this work to my wife Nobesuthu and my two lovely daughters, Kayleigh and Meghan. To my parents, I am so grateful for laying a foundation on which much that I do today is built.*

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**LIST OF ACRONYMS AND ABBREVIATIONS**

Anti-HBc	Hepatitis B core antibody
Anti-HBs	Hepatitis B surface antibody
Anti-HBe	Antibody to HBeAg
CDC	Centres for Disease Control
DNA	Deoxyribonucleic acid
HBV	Hepatitis B virus
HBeAg	Hepatitis B endogenous antigen
HBIG	Hepatitis B immunoglobulin
HBsAg	Hepatitis B surface antigen
HCW	Health care worker
HCV	Hepatitis C virus
HIV	Human Immunodeficiency Virus
HPSC	Health Protection Surveillance Centre
IgG	Immunoglobulin G
IgM	Immunoglobulin M
MoHW	Ministry of Health and Wellness
NSI	Needle-stick injury
PEP	Post-exposure prophylaxis
TTI	Transfusion Transmissible infection
WHO	World Health Organization

## LIST OF OPERATIONAL DEFINITIONS

**Acute hepatitis B:** A new infection caused by HBV which may last up to 6months with or without symptoms. Clinical signs and symptoms include anorexia, malaise, nausea, vomiting, abdominal pains, and jaundice, and these appear within 4-12weeks.

**Antibody to hepatitis B surface antigen (anti-HBs):** Presence of this antibody indicates recovery and immunity from HBV infection. Anti-HBs also develops in a person who has been successfully vaccinated against Hepatitis B.

**Antibody to hepatitis B core antigen (anti-HBc):** There are two types of this antibody; IgG and IgM. Presence of IgG anti-HBc indicates past exposure or chronic infection and IgM anti-HBc indicates recent or acute infection with HBV.

**Attitude:** A way of behaving caused by one's feeling or opinion about something or someone (Hawker & Waite 2007:53). The attitudes of registered nurses were based on their responses to 9 statements, and the responses were structured on a 3-point Likert scale.

**Chronic HBV infection:** Presence of HBsAg for more than 6 months.

**Clinical area of practice:** Workstation or department of the hospital where a registered nurse is working.

**Hepatitis B (HB):** Inflammation of the liver caused by the hepatitis B virus (HBV).

**Hepatitis B e-antigen (HBeAg):** An antigen found in the blood during acute and chronic infection indicating active replication of HBV.

**Hepatitis B surface antigen (HBsAg):** A protein on the surface of the virus that can be detected in high levels in serum during acute or chronic HBV infection.

**Horizontal transmission:** The spreading of HBV through close person to person contact.

**Knowledge:** The general understanding or familiarity with a subject that you get by experience or study (Hawker & Waite 2007:509). Knowledge of the registered nurses was determined using 11 questions with each correct answer scoring 1.

**Non-responder:** A person who fails to produce adequate antibody levels after complete HB vaccination.

**Perinatal (vertical) transmission:** This refers to transmission of HBV from an infected mother and her baby, immediately before and after birth.

**Registered nurse:** A person medically trained to take care of the sick, and registered with the Nursing and Midwifery Council of Botswana.

**Responder:** A person who produces protective antibody levels after complete HB vaccination.

**Standard precautions:** These are guidelines meant to reduce the risk of transmission of pathogens by providing a high level of protection to patients, HCWs, and visitors.

**Vaccination status:** The condition of the registered nurses with regard to vaccination against hepatitis B virus. Vaccination refers to the injection of a killed or attenuated microbe in order to stimulate the immune system thereby preventing disease or infection (WHO 2017).

# **CHAPTER 1**

## **ORIENTATION TO THE STUDY**

### **1.1 BACKGROUND TO THE STUDY**

The most serious occupational health hazard faced by health care workers (HCWs) is exposure to blood-borne pathogens. Three pathogens that account for most cases due to their prevalence in patients and the severity of the disease they cause are hepatitis B virus (HBV), hepatitis C virus (HCV) and Human Immunodeficiency virus (HIV). The highest proportion of occupational transmission is due to percutaneous injuries (Deuffic-Burban, Delarocque-Astagneau, Abiteboul, Bouvet & Yazdanpanah 2011:4). HBV is a highly infectious blood borne pathogen that causes acute and chronic hepatitis B. In health facilities, health care workers are at risk for exposure to HBV from infected patients and, if infected, are similarly at risk of transmitting HBV to patients.

Botswana has the world's second highest HIV prevalence (24.8%) of adults aged 15-49 years old and the majority of the country's infectious disease burden is HIV-related (Chandra, Mullan, Ho-Foster, Langeveldt, Caruso, Motsumi & Kestler 2014:110). A study conducted in Gaborone, Botswana revealed that HBV co-infection is relatively common in HIV infected adults. (Patel, Davis, Tolle, Mabikwa & Anabwani 2011:390). Another study conducted in Gaborone revealed a higher prevalence of chronic HBV infection of 3.1% among HIV-infected pregnant women compared with 1.1% among HIV-uninfected women (Mbangiwa, Kasvosve, Anderson, Thami, Choga, Needleman, Phinius, Moyo, Leteane, Leidner, Blackard, Mayondi, Kammerer, Musonda, Essex, Lockman & Gaseitsiwe 2018). HIV positive patients admitted in Nyangabgwe Hospital are likely to comprise in a significant number of HBV carriers, resulting in a high risk of exposure to HBV for HCWs and other patients.

### **1.2 PROBLEM STATEMENT**

Nurses frequently get in contact with patients' blood and potentially infectious body fluids while performing their duties, as a result, they are at an increased risk of exposure to HBV. The level of risk depends on the number of patients with HBV infection, the

standard precautions taken while nursing the patients and the HB vaccination status. Regarding hepatitis B (HB) vaccination, previous studies have found sub-optimal protection among HCWs.

In Botswana government health facilities, the decision for HB vaccination uptake is dependent upon the health care worker's knowledge and attitude regarding HBV prevention and control. Despite the availability of a free, safe and effective vaccine for HCWs, there is a possibility that a significant number of registered nurses at Nyangabgwe Hospital are still not protected against HBV, hence putting other HCWs and patients at risk.

### **1.3 PURPOSE OF THE STUDY**

This study aims to investigate the knowledge, attitudes and vaccination status of registered nurses in Botswana regarding hepatitis B prevention and control.

#### **1.3.1 Research questions**

- What is the knowledge of registered nurses at Nyangabgwe Hospital regarding HBV prevention and control?
- What is the attitude of registered nurses at Nyangabgwe Hospital regarding HBV prevention and control?
- What is the vaccination status of registered nurses at Nyangabgwe Hospital regarding HBV prevention and control?
- Is there any association between (1) knowledge and vaccination status, (2) attitudes and vaccination status, and (3) clinical area of practice and vaccination status, among registered nurses at Nyangabgwe Hospital regarding HBV prevention and control?
- What are the predictors of HBV vaccination uptake among the registered nurses at Nyangabgwe Hospital?

### **1.3.2 Research objectives**

- To assess the knowledge of registered nurses at Nyangabgwe Hospital regarding HBV prevention and control.
- To assess the attitude of registered nurses at Nyangabgwe Hospital regarding HBV prevention and control.
- To explore the vaccination status of registered nurses at Nyangabgwe Hospital regarding HBV prevention and control.
- To determine if there are any associations between knowledge and vaccination status, attitudes and vaccination status, and clinical area of practice and vaccination status, among registered nurses at Nyangabgwe Hospital regarding hepatitis B prevention and control.
- To determine the predictors of HBV vaccination uptake among the registered nurses at Nyangabgwe Hospital.

### **1.4 JUSTIFICATION OF THE STUDY**

Nurses contribute the largest proportion of HCWs and their general knowledge and attitudes regarding the prevention of communicable diseases have a direct impact on the goals of public health. Occupational exposures are common within health facilities, putting both nurses and patients at risk of infections. The study findings may identify gaps in issues related to occupational health and safety regulations. It is therefore important to evaluate the level of awareness of registered nurses in the fight against HBV so that effective programmes through policies that ensure protection for all HCWs and their patients can be developed and implemented.

### **1.5 SUMMARY**

This chapter has provided the background to the study and the purpose of the study. The next chapter will present a literature review on the epidemiology of HBV, prevention and control of HBV infection, as well as knowledge, attitudes and vaccination status of nurses and other HCWs regarding the HB prevention and control.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

The previous chapter outlined the purpose of the study, the research objectives and the problem statement. This chapter presents a review of the literature on the epidemiology of HBV, prevention and control of HBV infection, as well as knowledge, attitudes and vaccination status of nurses regarding the HB prevention and control.

#### **2.2 AETIOLOGY OF HEPATITIS**

Hepatitis is an inflammation of the liver (WHO 2015). The condition can be self-limiting or can progress to fibrosis (scarring), cirrhosis or liver cancer. Hepatitis viruses are the most common causes of hepatitis in the world but other infections, toxic substances and auto-immune diseases can also cause hepatitis. There are five main hepatitis viruses, referred to as types A, B, C, D and E (WHO 2015). Hepatitis B is a major health problem in most parts of the world including sub-Saharan Africa (WHO 2017).

#### **2.3 HBV STRUCTURE**

HBV is a double-stranded deoxyribonucleic acid (DNA) virus, a species of the genus *Orthohepadnavirus*, and a member of the *Hepadnaviridae* family of viruses. The virus particle, called Dane particle (virion), is made up of an outer lipid envelope and an icosahedral nucleocapsid core composed of protein. The nucleocapsid encloses the viral DNA and a DNA polymerase that has reverse transcriptase activity similar to retroviruses. The nucleocapsid core contains hepatitis B core antigen (HBcAg). The outer lipid envelope contains hepatitis B surface antigens (HBsAg). Hepatitis B endogenous antigen (HBeAg) is a soluble antigen that can be released from the nucleocapsid core particles (Liang 2009:S14).

## 2.4 DIAGNOSIS

The general diagnosis of hepatitis is based on clinical, biochemical, histological and serological findings (Liang 2009:S15). However, specific diagnosis of HBV infection is based on serologic findings focusing on the detection of several HBV specific antigens and antibodies in the blood. Different serologic markers or combination of markers are used to identify different phases of HBV infection and to determine whether a patient has acute or chronic HBV infection, is immune to HBV as a result of prior infection or vaccination, or is susceptible to infection (CDC 2005). HBV DNA followed shortly afterward by HBsAg and HBeAg are the first viral markers detected in serum (Liang 2009:S15).

### 2.4.1 Serological markers

- **Hepatitis B surface antigen (HBsAg):** A protein on the surface of the virus. It can be detected in high levels in serum during acute or chronic HBV infection. The presence of HBsAg indicates that the person is infectious. This is the first detectable marker of infection and is present as early as the incubation period. HBsAg is the antigen used to make hepatitis B vaccine (CDC 2005).
- **Hepatitis B surface antibody (anti-HBs):** The body normally produces antibodies to HBsAg as part of the normal immune response to infection. The presence of this antibody indicates recovery and immunity from HBV infection. Anti-HBs also develops in a person who has been successfully vaccinated against hepatitis B (CDC 2005).
- **Total hepatitis B core antibody (anti-HBc):** Appears at the onset of symptoms in acute hepatitis B and persists for life. The presence of anti-HBc indicates previous or ongoing infection with hepatitis in an undefined time frame (CDC 2005).
- **IgM antibody to hepatitis B core antigen (IgM anti-HBc):** The presence of this antibody indicates a recent, acute infection with HBV (CDC 2005)
- **IgG antibody to hepatitis B core antigen (IgG anti-HBc):** The most sensitive marker of past exposure to HBV, its presence indicates chronic infection (CDC 2005).

- **Hepatitis B e-antigen (HBeAg):** An antigen found in the blood during acute and chronic HBV infection. A positive HBeAg test indicates that the HBV is actively replicating and the infected person has high levels of the virus (CDC 2005).
- **Antibody to hepatitis B e-antigen (anti-HBe):** This antibody is produced temporarily during acute HBV infection or consistently during or after a burst in viral replication. A person who converts from positive HBeAg to anti-HBe is more likely to achieve long-term clearance of the virus. Presence of anti-HBe indicates loss of HBV replication and initiation of recovery (CDC 2005).

**Table 2.1 Interpretation of hepatitis B serologic test results**

Serological marker	Status	Clinical interpretation
HBsAg anti-HBc anti HBs	Negative Negative Negative	Susceptible
HBsAg anti-HBc anti-HBs	Negative Positive Positive	Immune due to natural infection
HBsAg anti-HBc anti-HBs	Negative Negative Positive	Immune due to hepatitis B vaccination
HBsAg anti-HBc IgM anti-HBc anti-HBs	Positive Positive Positive Negative	Acute infection
HBsAg anti-HBc IgM anti-HBc anti-HBs	Positive Positive Negative Negative	Chronic infection
HBsAg anti-HBc anti-HBs	negative positive negative	Interpretation unclear; four possibilities  1 Resolved infection (most common) 2 False-positive anti-HBc, thus susceptible 3 “Low level” chronic infection 4 Resolving acute infection

(CDC 2005)

## 2.5 TRANSMISSION OF HBV

HBV can survive outside the body for at least 7 days. During this time, the virus can still cause infection to a person who is not protected against the virus. The incubation period of HBV varies from 30 to 180 days with an average of 75 days. HBV is spread by percutaneous or mucosal exposure to infected blood and various body fluids such as saliva, menstrual, vaginal and seminal fluids. It can also be sexually transmitted. Infection can occur during medical, surgical and dental procedures through the use of objects contaminated with infected blood and body fluids (WHO 2017).

Transmission can be classified as vertical or perinatal if it is spread from an infected mother to the child at birth, horizontal if it is through close person to person contact, parenteral when it is through injections or other invasive medical procedures or injuries, and sexual when it is through sexual contact (Mathews, Robotin & Allard 2014:44). In highly endemic areas, HBV is most commonly spread from mother to child at birth (perinatal transmission) or through horizontal transmission (exposure to infected blood and other body fluids), especially from an infected child to an uninfected child during the first 5 years of life (WHO 2017). Infected children may spread the virus to other children if there is frequent contact (for example, playground contact) thereby making direct contact with infected body fluids inevitable. High levels of HBV DNA were found in the saliva of HBeAg (+) children, suggesting saliva as a vehicle for horizontal transmission of HBV among children (Heiberg, Hoegh, Ladelund, Niesters & Hogh 2010:465). One study concluded that tears from children with chronic hepatitis B virus infection are infectious vehicles of HBV transmission (Komatsu, Inui, Sogo, Tateno, Shimokawa & Fujisawa 2012:478).

In a hospital setting, HBV can be transmitted from one patient to the other, from one patient to the HCW and from the HCW to the patient. The three main routes of transmission are needle-stick injuries (NSIs) resulting in the direct transmission of infected blood or body fluids, direct contact of non-intact skin or mucous membrane with infected blood or body fluids, and indirect contact of contaminated surface with non-intact skin or mucous membrane. The analysis of transmission pathways showed that some breaches in infection control measures, such as administration of drugs using multi-vial compounds and capillary blood sampling, are the most frequent routes for

patient-to-patient transmission of hepatitis B virus (Lanini, Puro, Lauria, Fusco, Nisi & Ippolito 2009). There are still countries where blood transfusions, organ transplants and other medical interventions pose an extreme risk because donors are not screened for HBV. In most countries where screening is in place, the risk of infection is low. Consequently, WHO strongly recommends that all blood donations be tested for HBV to ensure blood safety and avoid accidental transmission to recipients of blood and blood products (WHO 2017).

Exposure through injuries from contaminated needles is the most common mode of patient to HCW transmission. In the United States, from 1997 to 1998, more than 385,000 NSIs occurred annually (MacCannell, Laramie, Gomaa & Perz 2010:24). In the United Kingdom, 37% of nurses had sustained a NSI injury at some stage during their career (Muljono, Wijayadi & Sjahril 2018:90). Approximately 40–60% of the occupational HBV infections arise due to sharps injuries in developing countries. A NSI on average inoculates roughly the quantity of blood that could probably carry up to 100 infectious doses of HBV. The transmission of HBV is dependent on the degree of contact with infectious material as well as the HBeAg status of the source. The risk of transmission of HBV is high (32%–67%) when blood is positive for both HBsAg and HBeAg. However, the risk of transmission is less than 6% when HBeAg is negative (Kashyap, Tiwari & Prakash 2018:33).

In as much as HCWs are at risk for exposure to HBV from infected patients, if infected, they are at risk of transmitting HBV to patients. Published cases of HBV transmission from HCW to patient are relatively rare, having decreased in frequency following the introduction of standard (universal) precautions, adoption of enhanced percutaneous injury precautions such as double-gloving in surgery, and routine HBV vaccination of HCWs (Lewis, Enfield & Sifri 2015:488). To be at risk of transmitting HBV infection to a patient, the HCW requires to be viremic and there has to be a direct contact of blood or body fluid between the two. Hence the high level of viremia, the clinical setting of an exposure-prone procedure or the degree of contact with blood and body fluid are the only factors that would determine this kind of transmission (Kashyap et al 2018:32).

## **2.6 EPIDEMIOLOGY**

### **2.6.1 Global perspective**

In 2015, an estimated 257 million people were living with chronic HBV infection globally. The epidemic caused by HBV affects mostly the WHO African Region and the Western Pacific Region (WHO 2017).

Hepatitis B prevalence is highest in the WHO Western Pacific Region and the WHO African Region where 6.1 % and 6.2 % of the adult population is infected. In 2015 the global prevalence of HBV infection in the general population was 3.5%. Among those born before the introduction of hepatitis B vaccine, the proportion of persons living with chronic HBV remains high (WHO 2017). About 2.7 million of the 36.7 million living with HIV worldwide are also infected with HBV. The global prevalence of HBV infection in HIV-infected persons is 7.4% (WHO 2017).

### **2.6.2 Epidemiology in Botswana and other African countries**

The prevalence of HBV infection is similar across different groups of HIV-infected persons (WHO 2017). Most HIV/HBV co-infected persons live in sub-Saharan Africa.

In Southern Africa, a study conducted among South African and Zambian patients in 2008 reported an HIV/HBV co-infection rate of 7.4%; another study conducted amongst South African and Botswana patients in 2013 reported almost the same HIV/HBV co-infection rate of 7.0%. (Mandiwana & Tshitenge 2017:95). Available data suggests that approximately 8% of the general population across Southern Africa have been infected with HBV. Chronic HBV infection is a common condition in Zambia. From an HIV cohort, the prevalence of chronic HBV is 10-12% (WHO 2017).

The prevalence of HBsAg among nurses in South Africa was 1.8%, and all were black nurses. HBV is endemic in South Africa (Mosendane, Kew, Osih & Mahomed 2012:153). A study conducted in Nigeria found that 2.5% of midwives contracted HBV infection through practice may be due to a breach in universal precautions or unvaccinated status. In the same study, it was revealed that 30.8% did not practice universal precautions and 36.7% had not received hepatitis B vaccination (Ella,

Samson-Akpan & Akpabio 2016:97-98). According to Tanzania National Blood Transfusion Services (TNBTS) report, HBV infection was the most frequent Transfusion Transmissible Infection (TTI) detected in all blood units collected in the country with a detection rate of 6.2% and contributing 42% of all TTIs (Kilonzo, Gunda, Mpondo, Bakshi & Jaka 2018). Another study in Tanzania revealed an overall prevalence of chronic HBV infection among HCWs of 7.0 % (Mueller, Stoetter, Kalluvya, Stich, Majinge, Weissbrich & Kasang 2015). In Cameroon, seroprevalence of HBsAg has been reported to be 10.1 % in a general population of blood donors, 10.2 % among pregnant women and 23.7 % among HIV-infected patients (Tatsilong, Noubiap, Nansseu, Aminde, Bigna, Ndze & Moyou 2016).

Two similar studies conducted in Botswana on HIV/HBV co-infection revealed HBsAg-positive rates of 5.3% (Patel et al 2011:391) and 5.1% (Mandiwana & Tshitenge 2017:95). A study conducted among HIV-positive women in South Africa and Botswana reported an HBsAg prevalence of 7.0% in the combined cohort and 3.8% in the Botswana cohort (Matthews, Beloukas, Malik, Carlson, Jooste, Ogwu, Shapiro, Riddell, Chen, Luzzi, Jaggernath, Jesuthasan, Ndung'u, Goulder, Geretti & Klenerman 2015).

## **2.7 SIGNS AND SYMPTOMS**

The symptoms of hepatitis B depend on whether a person has acute or chronic hepatitis B infection.

### **2.7.1 Acute hepatitis**

Acute hepatitis develops after the incubation period and is characterised by elevated alanine transaminase (ALT) levels lasting 4–12 weeks (Mathews et al 2008:45). Most people do not experience any symptoms during the acute infection phase. However, some people have an acute illness with symptoms that last several weeks, including yellowing of the skin and eyes (jaundice), dark urine and pale-coloured stools, extreme fatigue, nausea, vomiting and right upper quadrant abdominal pain. A small subset of persons with acute hepatitis can develop acute liver failure, which can lead to death (WHO 2017).

### **2.7.2 Chronic hepatitis**

The transition from acute to chronic infection shows a failure of the immune response to eliminate the virus. Chronic hepatitis B (CHB) is defined serologically as HBsAg positivity for more than 6 months. Progression from acute to CHB infection is influenced by the age at which the subject acquires the virus (Mathews et al 2008:46). 80-90% of infants infected during the first year of life develop chronic infections and 30-50% of children infected before the age of 6 years develop chronic infections (WHO 2017). This is related to the inability of the immune system to recognise the virus and the high level of viral replication results in immunological tolerance. In adults, a cell-mediated response to foreign HBV proteins results in acute hepatitis, which may be asymptomatic, and the response leads to clearance of the infection in all but 1–5% of patients (Mathews et al 2008:46). In some people, the hepatitis B virus can cause a chronic liver infection that can later develop into cirrhosis (a scarring of the liver) or liver cancer (WHO 2017).

## **2.8 PREVENTION AND CONTROL IN HEALTH-CARE FACILITIES**

### **2.8.1 Hepatitis B vaccination**

The hepatitis B vaccine is the mainstay of hepatitis B prevention. The complete vaccine series induces protective antibody levels in more than 95% of infants, children and young adults. Protection lasts at least 20 years and is probably lifelong (WHO 2017).

WHO recommends that all infants receive the hepatitis B vaccine as soon as possible after birth, preferably within 24 hours. In 2015, the prevalence of HBV infection in children under 5 years of age was about 1.3% compared with about 4.7% in the pre-vaccination era. People in the high-risk groups should also be vaccinated if not previously vaccinated. These high-risk groups include people who frequently require blood and blood products, dialysis patients, recipients of solid organ transplantations, injectable drug users, household and sexual contact of people with chronic HBV infection, HCWs and others who may be exposed to blood and other body fluids through their work; and travellers to endemic areas who have not completed their HB vaccination series (WHO 2017).



Given that HBV is a condition that is preventable by vaccination, all individuals should ideally be vaccinated as a precaution before entering the health care workforce. Once vaccinated, it is recommended that HCWs are tested for anti-HBs, to check if they have responded to the vaccine. Testing for anti-HBs should be done 1 to 2 months after completion of the three-dose series. Despite the high efficacy of the HBV vaccine, nearly 5% of immunocompetent individuals fail to respond to the primary HBV series. (Walayat, Ahmed, Martin, Puli, Cashman & Dhillon 2015:2505).

Although HBV infection rates among HCWs were higher than those of the general population before the development of the HBV vaccine, this situation has been reversed with many HCWs having previously received the vaccine. Since the introduction of HBV vaccine in 1982, a study in the United States showed an increasing number of HCWs being fully vaccinated and a dramatic decrease in the number of HBV infections among HCWs who are now at lower risk of HBV infection than the general US population (CDC 2005).

### **2.8.2 Injection safety**

Injections are one of the widely used procedures in health care. The vast majority, approximately 90% of injections are given in curative care, 5% in immunisations and the remaining covering other indications, including transfusion of blood and blood products, intravenous administration of drugs and fluids and the administration of injectable contraceptives (WHO 2016). A safe injection is one that does not injure the recipient, does not expose the HCW to any preventable risk, and does not result in any waste that is likely to cause great harm to the community (Chaudhuri & Ray 2016:21). Eliminating unnecessary and unsafe injections can be effective strategies to protect against HBV transmission (WHO 2016).

### **2.8.3 Screening of blood and blood products**

Blood transfusion is a life-saving intervention that has an essential role in patient management within health delivery systems. Blood safety strategies including a quality-assured screening of all donated blood and blood components used for transfusion can prevent transmission of HBV. Worldwide in 2013, 97% of blood donations were screened and quality-assured, but gaps persist (WHO 2017). It is these gaps that can

result in transfusion-associated HBV (TAHBV) infections. There is a high incidence of TAHBV reported in patients receiving multiple transfusions in India (Sakwe & Sakwe 2010:248). Among Zambian blood donors, up to 8% are chronically infected with HBV. The South African black population has the highest incidence of infection, with prevalences of antibody to the hepatitis B surface antigen (anti-HBs) of 42.9%, 3.4%, and 1.2% in black, Asian, and Caucasian blood donors, respectively (Mosendane et al 2012:153).

In Botswana, at the Francistown Regional Blood Transfusion, HBV screening is done using HBsAg as the only marker for active infection. In the vast majority of cases of HB, the detection of anti-HBc is of limited value as HBsAg is already present. In some cases, however, during the resolution of the infection, HBsAg may decline to below detectable levels (WHO 2009). It has been demonstrated that some HBsAg-negative and anti-HBc positive individuals continue to replicate HBV. Therefore the negative HBsAg in the blood of apparently healthy donor may not be sufficient to ensure the absence of circulating HBV, thus rendering the blood infectious. If anti-HBc screening is introduced for routine use, it would be necessary to distinguish between individuals who are anti-HBc reactive because of previous, resolved, natural HBV infection, and are thus non-infectious, from those who have unresolved HBV infection and are thus potentially infectious. While screening for anti-HBc is not recommended as a routine, countries, however, should determine the need for anti-HBc screening based on the prevalence and incidence of HBV infection (WHO 2009).

The presence of anti-HBs is protective, therefore, anti-HBs testing of all anti-HBc reactive donations would be required to distinguish between infectious and non-infectious individuals. In general, a level of anti-HBs at 100 mIU/mL is usually accepted as the minimum protective level in the context of blood screening; donations that are HBsAg negative, anti-HBc reactive with anti-HBs levels of 100mIU/mL or more are generally considered to be safe and acceptable for release for clinical or manufacturing use (WHO 2009). Highly sensitive and specific screening tests should be used.

#### **2.8.4 Post-exposure prophylaxis**

In a health-care facility, occupational exposures to HBV may occur. After exposure to HBV, appropriate and timely prophylaxis can prevent HBV infection. Post-exposure

prophylaxis (PEP) is based mainly on active immunisation with HB vaccine and passive immunisation with HBIG. The primary advantage of passive immunisation with preformed antibodies is the prompt availability of large amounts of antibody (Brooks, Carrol, Butel, Morse & Mietzner 2013:137). The mainstay of PEP is the hepatitis B vaccine, but, in certain circumstances, HBIG (hepatitis B immunoglobulin) is recommended in addition to the vaccine for added protection. Hepatitis B vaccine is highly effective in preventing acute infection after exposure if given within 7 days and preferably within 48 hours. Post-exposure management is determined by the vaccination status of the HCW and the HBV status of the source. An accelerated HB vaccine course may be required and this consists of doses at 0, 1 and 2 months (HPSC 2016).

HBIG is only indicated where the source is known HBsAg positive and where the recipient is a known non-responder to HBV vaccination. HBIG should ideally be given within 48 hours but not later than 7 days after exposure. Simultaneous administration of HBIG and HB vaccine dose is done on separate injection sites (HPSC 2016).

#### ***2.8.4.1 Exposure to HBsAg positive source***

Unvaccinated HCWs should be given HBIG and initiated on accelerated HB vaccine course. Documented non-responders to a complete hepatitis B vaccine series should receive both HBIG and hepatitis B vaccine dose simultaneously. Fully vaccinated HCWs but anti-HBs unknown and those not fully vaccinated (<3 doses) should receive HBV vaccine dose, and HBIG if anti-HBs is <10mIU/ml (HPSC 2016).

#### ***2.8.4.2 Exposure to unknown HBsAg source***

HCWs who are unvaccinated should be initiated on accelerated HB vaccine course. Fully vaccinated HCWs but anti-HBs unknown, those not fully vaccinated and non-responders to HB vaccine series should receive HB vaccine dose. In non-responders, HBIG may be considered. In addition, every effort should be made to test the source. In both exposures, HCWs who are known responders to HBV vaccine (anti-HBs  $\geq 10$ mIU/ml) are protected and need no further vaccine doses, and for non-responders, an alternative vaccination strategy may be required (HPSC 2016).

## **2.8.5 Standard precautions**

These are standard guidelines meant to reduce the risk of transmission of blood-borne and other pathogens from both recognised and unrecognised sources. “Standard precautions” require that health care workers assume that the blood and body substances of all patients are potential sources of infection, regardless of the diagnosis, or presumed infectious status. Additional precautions are needed for diseases transmitted by air, droplets and contact. These are termed “additional (transmission-based) precautions” (WHO 2004). Standard precautions provide a high level of protection to patients, health care workers and visitors. These include: hand washing and antisepsis (hand hygiene), use of personal protective equipment when handling blood, body substances, excretions and secretions; appropriate handling of patient care equipment and soiled linen; prevention of needle-stick/sharp injuries; environmental cleaning and spills-management; and appropriate handling of waste (WHO 2004).

## **2.9 KNOWLEDGE**

### **2.9.1 Knowledge regarding occupational risk**

HCWs are aware of their risk of occupational exposure to HBV infection. 96.8% of HCWs correctly identified their work as increasing the risk of acquiring HBV infection. In Bangladesh, 84.3% of nurses were aware that health workers are at risk of getting hepatitis B (Mehriban, Ahsan & Islam 2014:50). However, several studies have demonstrated that among HCWs, the knowledge relating to the occupational risk of contracting and transmission of HBV is low. A study conducted in Ghana revealed that although 94.4% of the nurses considered themselves susceptible to occupational infection of HBV, 7.4% of nurses did not know that splash of blood into mucous membranes/non intact skin poses a risk to the hepatitis infection, and only 9.3% knew that hepatitis B vaccine is used as post-exposure prophylaxis (Konlan, Aarah-Bapuah & Kombat 2017:258). In a study conducted in South Africa on occupational exposure to blood borne viruses, only 10.9% of the source patients were tested for HBV after exposure, on the other hand, as many as 68.9% were tested for HIV after exposure (De Villiers, Nel & Prinsloo 2007:14). A similar finding was observed amongst Nigerian dental auxiliaries where 74.7% of them agreed that it was easier to contract HIV than hepatitis B through needle-stick in the dental clinic (Azondo, Ehigiator & Ojo 2010:365).

This shows that HCWs are more alert towards HIV than HBV, despite HBV being more infectious.

### **2.9.2 Knowledge about hepatitis B vaccine**

Awareness of the existence of HB vaccine has been found to be high among HCWs. 95% of nurses in India (Amanpreet, Ramandeep, Simarpreet & Jyotsna 2016:258), 93.4% of HCWs in Nigeria (Adekanle, Ndububa, Olowookere, Ijarotimi & Ijadunola 2015) and 85% of HCWs in Zambia (Mungandi, Makasa & Musonda 2017). Regarding the level of awareness of hepatitis B vaccine, as little as 5.2% of HCWs in Nigeria had good knowledge and 11.9% did not know the number of doses required for complete protection (Samuel, Aderibigbe, Salami & Babatunde 2009:421). 48.2% of nurses in Ethiopia had good knowledge while the rest had unfavourable knowledge (Abeje & Azage 2015).

## **2.10 ATTITUDES**

### **2.10.1 Attitudes regarding occupational risk**

Studies have revealed both negative and positive attitudes among HCWs regarding HBV as an occupational hazard. In a study conducted in northern Nigeria, 86.5% of primary HCWs had good knowledge of HB infection, however, their general perception of the occupational risk was low. 57.6% of them considered the risk as low while 25.7% said they stood no risk at all of contracting HBV from their work and 3.8% were unsure. (Daboer, Chingle & Banwat 2010:12). In a similar study in Southern Nigeria, 81% of HCWs had high knowledge, but two-fifths of them were of the opinion that they are not at risk of contracting the infection (Samuel et al 2009:421-422).

### **2.10.2 Attitudes towards HB vaccination**

Hepatitis B vaccine has been widely accepted as an effective method in preventing HBV infection. A study in Tanzania showed that 96.8% of the HCWs agreed that the vaccine should be made compulsory and 89.7% had trust in the vaccine (Aaron, Nagu, Rwegasha & Komba 2017). A study conducted in Lusaka Zambia indicated that 97.0%

of the HCWs were willing to get vaccinated if the vaccine were to become available in their institution (Mungandi et al 2017).

However, several studies have indicated negative attitudes towards the HBV vaccination amongst HCWs. Some of the reasons cited by HCWs for poor compliance to hepatitis B vaccination include busy schedules, time lost (and perhaps income) while getting the vaccination, procrastination, lack of knowledge about vaccine efficacy, perception of low-risk status and the bother of a sore arm (Samuel et al 2009:422). Iranian dentists mentioned unwillingness and fear of complications as reasons for non-vaccination (Jalaleddin, Zahra, Kimia, Hesameddin & Zahra 2014:201).

Unvaccinated HCWs in Tanzania mentioned they were very careful and observed standard precautions while at work (Aaron et al 2017). In a study in Ethiopia, the nurses mentioned the fear of side effects of the vaccine and being a new employee as some of the reasons for not being vaccinated (Yimer, Mohammed, Muhammed & Tsige 2017).

## **2.11 VACCINATION COVERAGE**

Despite the availability of a safe and effective vaccine since 1982, overall coverage of hepatitis B vaccination among HCWs still remains unsatisfactory in many countries worldwide. A study conducted in Botswana among HCWs showed a vaccination coverage among nurses of 29.1% despite the availability of a free vaccine at their institution (Machiya, Burnett, Fernandes, Francois, De Schryver, Van Sprundel & Mphahlele 2015:258). One study in South Africa found high rates of active HBV infection and sub-optimal protection against HBV in HCWs suggesting the need to strengthen vaccination programmes through policies that ensures protection for all HCWs and their patients (Sondlane, Mawela, Razwiedani, Selabe, Lebelo, Rakgole, Mphahlele, Dochez, De Schryver & Burnett 2016:3835).

A study conducted in Tanzania to determine hepatitis B vaccination coverage among 334 HCWs found that 56.9% (190/334) of HCWs had received at least one dose of hepatitis B vaccination, while only 33.6% (117/334) were fully vaccinated (Aaron et al 2017). In a similar study conducted among Iranian dentists, 48.1% were fully vaccinated, 3.1% had incomplete vaccination and 48.8% had no vaccination at all (Jalaleddin et al 2014:201). A follow-up study at one academic hospital in Johannesburg

South Africa, a decade later, indicated that 52.4% of the nurses were now protected against HBV infection from the previous 30.6% (Mosendane et al 2012:155). A similar follow-up study in a Nigerian tertiary hospital showed a current vaccination coverage among HCWs of 65% from a previous 54%. Another study in Nigeria indicated that 63.3% of midwives were fully vaccinated (Ella et al 2016:98).

A study in Zambia conducted among 331 HCWs showed a very low vaccination coverage of 19.3% against hepatitis B (Mungandi et al 2017). Extremely low vaccination coverages were found in two studies in Ethiopia where only 8.8% of nurses (Yimer et al 2017) and 5.4% of HCWs (Abeje & Azage 2015) were fully vaccinated. A study conducted in Bangladesh found that 59% of nurses were fully vaccinated.

Among nurses, high vaccination rates of 92.4% were found in India (Amanpreet et al 2016:258) and 81% in the United States (Simard, Miller, George, Wasley, Alter, Bell & Finelli 2007:783). A study conducted in Serbia found a fairly high vaccination rate of 66.2% among HCWs (Kisic-Tepavcevic, Kanazir, Gazibara, Maric, Makismovic, Loncarevic & Pekmezovic 2017).

## **2.12 SUMMARY**

HBV infection still remains an important health concern given that it is frequently unrecognised by clinicians. Occupational exposure to HBV is an everyday reality for HCWs but they seem to be more vigilant to HIV than HBV. HCWs are aware of the existence of the hepatitis B vaccine but their knowledge about the vaccine is generally low. Lack of knowledge has probably resulted in poor compliance to HB vaccination. Positive attitudes towards HB vaccination amongst HCWs have been noted. However, vaccination coverage still remains alarmingly low, especially in African countries. In the next chapter, the research design and methodology will be discussed.

## **CHAPTER 3**

### **RESEARCH DESIGN AND METHODOLOGY**

#### **3.1 INTRODUCTION**

The previous chapter presented a literature review on the epidemiology of HBV, its prevention and control, as well as knowledge, attitudes and vaccination status of nurses regarding the prevention and control of HBV infection. This chapter will give a detailed outline on the research design and methodology used in this study to determine the knowledge, attitudes and vaccination status of registered nurses at Nyangabgwe Hospital regarding the prevention and control of HBV infection.

#### **3.2 STUDY DESIGN**

A study design is a structured approach followed by researchers to answer a particular research question (Joubert & Ehrlich 2014:77). In quantitative studies, there are two main categories of study designs, namely observational and experimental studies. In observational studies the researcher measures (observes) the occurrence of exposure and outcome, but does not intervene, whereas, in experimental studies, there is an active attempt to change the exposure (risk factors) of an outcome or the progress of the outcome. Observational studies can either be descriptive or analytical. A descriptive study is limited to the description of the occurrence of an outcome, and an analytical study goes further to identify the risk factors for the outcome by examining associations between the risk factors and the outcome (Joubert & Ehrlich 2014:78)

The two types of descriptive studies are the cohort and the cross-sectional. Analytical studies are cohort, case-control, cross-sectional and ecological studies. Cross-sectional studies measure the prevalence of an outcome. In a cross-sectional study, the measurements of the risk factors (exposure) and outcome are made at the same time. In this study, an analytical, cross-sectional study using self-administered questionnaires with closed-ended questions was used.



### **3.3 STUDY SETTING**

Nyangabgwe Hospital is a government health institution located in Francistown, the second largest city of Botswana. It is the only referral hospital serving the northern population of the country.

### **3.4 STUDY POPULATION**

A study population refers to a group from which information is gathered and conclusions are drawn (Joubert & Ehrlich 2014:94). In this study, the study population was defined as all registered nurses working at Nyangabgwe Hospital. The hospital has approximately 450 registered nurses.

### **3.5 STUDY SAMPLE AND SAMPLING METHOD**

A study sample refers to a subset of the study population comprising those selected to participate in the study (Polit & Beck 2008:742). The sample size was calculated using the simple formula for descriptive studies: sample size,  $n = (z^2pq)/d^2$ . Based on previous studies, the following assumption was made; between 72% and 81% of the registered nurses should be vaccinated against HBV. Using a 95% confidence interval and an anticipated population proportion of 76.5%, the calculated sample size was 277, however, 300 was made the final sample size. Stratified random sampling was the sampling method used to recruit respondents. Recruitment continued until the required sample size within each stratum was attained.

Stratified random sampling is a probability sampling technique where the study population is divided into different strata (subgroups) which should be mutually exclusive and collectively exhausted from which individuals are then selected using simple random sampling (Joubert & Ehrlich 2014:97-98). A stratified random sampling technique was chosen because it ensures proportional representation of registered nurses in the final sample. Each ward in the hospital where the registered nurses are working fall into one of the following categories (clinical area of practice): theatre, maternity, outpatient, intensive care, medicine, surgery, emergency and psychiatry. The study population was divided into different strata according to the clinical area of practice.

A sampling frame was compiled using different lists of registered nurses working in the respective hospital wards/departments, and using this sampling frame, the sample was proportionately divided into these different strata (Table 3.1). All the registered nurses within each stratum were assigned consecutive numbers starting from 1 to the last one. Random numbers were generated using Microsoft Excel. From each stratum, a simple random sample of respondents was then selected. The selected respondents (registered nurses) who agreed to participate in the study were given questionnaires.

Inclusion criteria – All registered nurses whose duties directly or indirectly expose them to HBV in Nyangabgwe Hospital.

Exclusion criteria – Registered nurses whose duties do not expose them to HBV.

**Table 3.1      Distribution of strata within the sample population**

<b>Clinical area of practice</b>	<b>Population</b>	<b>Percentage</b>	<b>Sample size</b>
Maternity	95	23.87	72
Theatre	22	5.53	17
Medicine	103	25.88	78
Surgery	64	16.08	48
Intensive care	43	10.80	32
Emergency	19	4.77	14
Outpatient	32	8.04	24
Psychiatry	20	5.03	15
<b>Total</b>	<b>398</b>	<b>100.0</b>	<b>300</b>

### **3.6      DATA COLLECTION TOOL**

Data was collected using a self-administered questionnaire with closed-ended questions (Annexure E). A questionnaire is a list of questions which are answered by the respondents, and which give indirect measures of the variables under investigation (Joubert & Ehrlich 2014:107). The questionnaire was divided into five sections: demographics, knowledge, attitude, HB vaccination status and exposure.

### **3.6.1 Validity and reliability**

For validity, the questionnaire content was assessed by an experienced researcher. Thereafter, pre-testing of the questionnaire was conducted on a small sample of 10 randomly selected registered nurses who did not meet the inclusion criteria. To these nurses, the objectives of the exercise were explained, and these were to check the clarity of the questions and observe how the respondents completed the questionnaire so that necessary adjustments can be done.

To ensure reliability, data was collected twice from this small sample to give two sets of data which were coded and captured onto Statistical Package for Social Sciences (SPSS) software version 22 by an experienced statistician. Each set of data was analysed and compared for any differences. The findings were identical.

### **3.6.2 Data collection method**

Permission to inform the registered nurses about the study was sought from the sisters in charge of the respective wards. The nurses were informed about the study at their workstations by the researcher. The researcher explained the structure of the questionnaire and mentioned the approximate time one can take to complete it. Those who consented to participate in the study signed a separate consent form (Annexure F) and were given the questionnaires to complete. Some of the respondents quickly filled the questionnaires and returned them to the researcher immediately. Some were left to complete the questionnaires which were collected from them at a later time.

## **3.7 DATA MANAGEMENT**

The signed consent forms and the completed questionnaires were stored in cabinets only accessible to the researcher. In the interest of confidentiality, no names or any identifying information appeared on the questionnaires. There was no temporary storage for completed questionnaires at the nurses' workstation. Whenever there were completed questionnaires, the researcher would be notified to come and collect them. No information provided by the respondents was shared with anyone.

Data from the questionnaires was captured onto SPSS. Coding was done on each questionnaire and the coded data was then captured onto SPSS. Data coding and entry onto SPSS continued until all the questionnaires were collected from the respondents.

### **3.8 DATA ANALYSIS**

Knowledge was determined on how the respondents answered 11 questions. A score of 1 was awarded for each correct answer and 0 for each incorrect answer or unanswered question. Therefore, the total knowledge score for each respondent could range from 0 to 11. This range was divided into 3 grades: poor, moderate and good knowledge. A total score of 0 - 3 was poor knowledge, 4 – 7 moderate knowledge and 8 – 11 good knowledge.

The respondents' attitudes were based on their responses to 9 statements. The responses to the statements were structured on a 3-point Likert scale. For positive statements, an attitude score of +1 was awarded for agreeing and -1 for disagreeing. For negative statements, disagreeing scored +1 and agreeing scored -1. A neutral response scored 0 for both statements. Therefore, the total attitude scores could range from -9 to +9. Similarly to knowledge scores, this range was divided into 3 grades: negative, neutral and positive attitude. A total score of -3 and below was negative attitude, -2 to +3 was neutral and +4 to +9 was positive attitude.

Descriptive statistics were used to summarise the data. To identify predictors of vaccination uptake, binomial logistic regression was used. A binomial logistic regression attempts to predict the probability that an observation falls into one of two categories of a dichotomous dependent variable based on one or more independent variables that can be either continuous or categorical. The dependent variable was vaccination status and the independent variables were knowledge, attitudes, clinical area of practice and demographics. The data met the following assumptions of this statistical test; the dependent variable is measured on a dichotomous scale, there should be one or more independent variables, which can be either continuous or categorical, there should be independence of observations and the dependent variable should have mutually exclusive and exhaustive categories, and data must not show multi-collinearity.

Chi-square test was used to determine associations among the variables, and the independent-samples (student's) t-test was used to determine if there were differences between the mean knowledge, and mean attitude scores for the vaccinated and unvaccinated respondents. Statistical significance was considered when the odds ratio was not equal to 1, the 95% confidence interval for the odds ratio did not contain 1 and the p-value was less than 0.05. The data met the following assumptions for Chi-square; variables should be measured at an ordinal or nominal level (i.e. categorical data) and should consist of two or more categorical, independent groups.

### **3.9 BIAS**

#### **3.9.1 Volunteer bias**

The study might have been affected by volunteer bias. Responses may have been higher in respondents with good knowledge and attitudes as compared to respondents with poor knowledge and attitudes. However, non-response from those with poor knowledge and attitudes was minimised by making the questionnaire anonymous.

#### **3.9.2 Recall bias**

Recall bias was also likely source of error in this study. To complete some section(s) of the questionnaire, respondents had to recall past exposures to HBV. Those respondents previously exposed to HBV could have remembered more information about HBV than those never exposed.

However, errors introduced by bias were minimised by stratified random sampling and making the study sample statistically powerful at 95% confidence interval.

### **3.10 ETHICAL CONSIDERATIONS**

Ethical clearance to conduct this study was granted by the Research Ethics Committee of UNISA Department of Health Studies (Annexure A). Permission was requested (Annexure B) and granted by Health Research and Development Committee of Botswana Ministry of Health and Wellness (Annexure C) and the Research and Ethics Committee of Nyangabgwe Hospital (Annexure D).

To protect the respondents' rights to self-determination and full disclosure, a consent form briefly explaining the purpose of the study was made available. The respondents were given time to go through the consent form. The researcher further explained the purpose of the study. The researcher emphasised that participation is entirely voluntary and they have the right to withdraw from participation without any consequences. Those who needed further clarification had their questions responded to by the researcher.

Consent to participation was shown by signing the consent form. The consent forms and the questionnaires were separated making it impossible to link the two. The respondents' right to privacy was protected by ensuring the confidentiality of the collected data. Anonymous questionnaires were distributed to the respondents. No respondent's identification information was captured by the questionnaire.

The researcher highlighted the potential risk of discomfort to the respondents, however, they were assured that their right to freedom from harm will be protected by ensuring confidentiality. The anticipated discomfort would emanate from information regarded as lack of knowledge and poor attitudes. The right to fair treatment was also protected as the benefits of the study to both the respondents and the society at large were clearly outlined.

### **3.11 SUMMARY**

A total of 219 questionnaires were returned from the initial 300 questionnaires that were distributed to the registered nurses. All the 219 questionnaires had usable responses that constituted the data that was analysed. In the next chapter, Chapter 4, the findings from the data analysis will be presented.

## **CHAPTER 4**

### **PRESENTATION OF RESULTS**

#### **4.1 INTRODUCTION**

The previous chapter outlined the research design and methodology highlighting the study setting, population and sampling, as well as how the data was collected and analysed. Ethical considerations were also discussed. This chapter will present the findings of the study and show how the objectives were achieved to give answers to the research questions.

#### **4.2 RESPONSE RATE**

From the 300 questionnaires that were distributed, a total of 219 questionnaires were returned by the respondents, resulting in a response rate of 73% (219/300).

#### **4.3 DESCRIPTIVE STATISTICS**

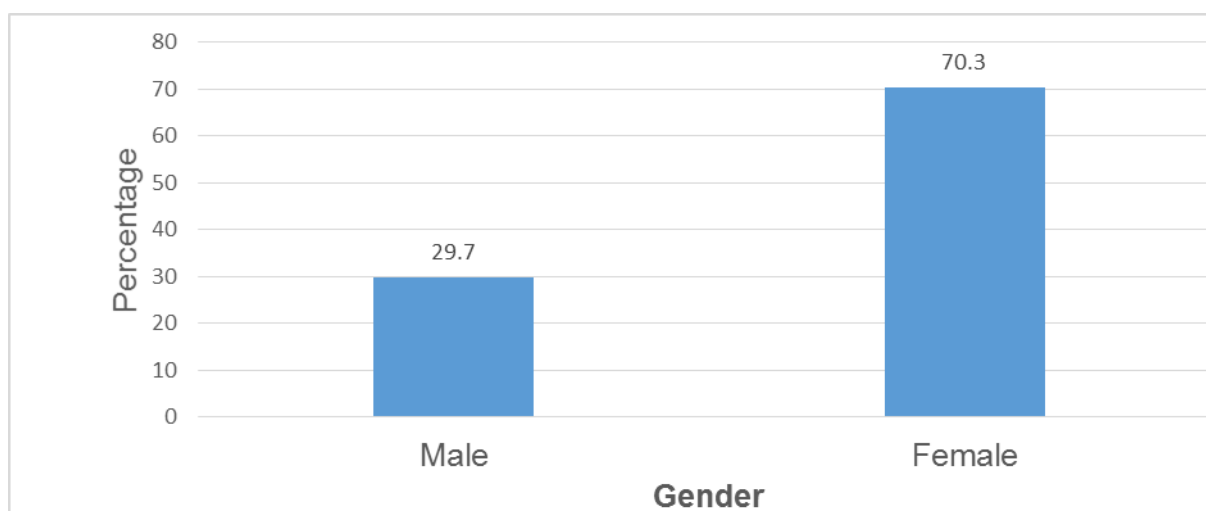
The findings of the study are presented using descriptive statistics as follows:

##### **4.3.1 Demographic profile**

The final study sample comprised 219 respondents. The majority of the respondents were females (70.3% [154/219]), had been employed as registered nurses for more than 9 years (72.6% [159/219]) and had a Diploma as the highest level of education (71.2% [156/219]) (Table 4.1, Figure 4.1 and Table 4.3). The largest number of registered nurses (47.9% [105/219]) were aged between 31 and 40 years old (Table 4.2).

**Table 4.1     Distribution of duration employed as a registered nurse**

Duration employed as a registered nurse (years)	Frequency	%
≤5	15	6.8
5-9	45	20.5
10-14	70	32.0
15-19	37	16.9
>20	52	23.7
<b>Total</b>	<b>219</b>	<b>100</b>

**Figure 4.1   Distribution of gender of the registered nurses****Table 4.2     Age distribution of the registered nurses**

Age (years)	Frequency	%
20–30	31	14.2
31–40	105	47.9
41–50	66	30.1
>50	17	7.8
<b>Total</b>	<b>219</b>	<b>100</b>

**Table 4.3     Distribution of highest level of education**

Qualification	Frequency	Percent
Diploma	156	71.2
Degree	60	27.4
Master's	3	1.4
<b>Total</b>	<b>219</b>	<b>100</b>



### 4.3.2 Knowledge regarding prevention and control of HBV

The knowledge scores could range from 0 - 11, and indeed, the actual scores of the respondents ranged from 0 - 11 with a mean of 7.59 (SD=1.87), a median of 8 and a mode of 7. The majority of the respondents (53% [116/219]) had good knowledge, 42.5% (93/219) had moderate knowledge and 4.6% (10/219) had poor knowledge.

**Table 4.4 Distribution of knowledge of registered nurses**

Knowledge	Frequency	Percent
Poor	10	4.6
Moderate	93	42.5
Good	116	53.0
<b>Total</b>	<b>219</b>	<b>100</b>

**Table 4.5 Distribution of knowledge in clinical areas of practice**

Clinical area of practice	Poor n (%)	Moderate n (%)	Good n (%)	Total n (%)
Maternity	5 (8.2)	26 (42.6)	30 (49.2)	61 (100)
Theatre	0 (0.0)	3 (20.0)	12 (80.0)	15 (100)
Medicine	2 (5.6)	15 (41.7)	19 (52.8)	36 (100)
Surgery	0 (0.0)	20 (57.1)	15 (42.9)	35 (100)
Intensive care	2 (7.1)	9 (32.1)	17 (60.7)	28 (100)
Emergency	0 (0.0)	1 (9.1)	10 (90.9)	11 (100)
Outpatient	0 (0.0)	14 (66.7)	7 (33.3)	21 (100)
Psychiatry	1 (10.0)	4 (40.0)	5 (50.0)	10 (100)

**Table 4.6 Distribution of responses to knowledge questions**

<b>Knowledge questions</b>	<b>Correct n (%)</b>	<b>Wrong n (%)</b>
HCWs who are carriers of HBV can transmit the infection to patients.	199 (90.1)	20 (9.1)
An infected person can be asymptomatic for a long time.	179 (81.7)	40 (18.3)
HBV infection can be prevented by a safe and effective vaccine	206 (94.1)	13 (5.9)
One or two doses can give lifelong immunity to 90% of adults.	99 (45.2)	120 (54.8)
After HB vaccination, there is no need for a blood test to confirm immunity.	121 (55.3)	98 (44.7)
HBV can be spread through contact with open wounds	191 (87.2)	28 (12.8)
HBV is more infectious than HIV	164 (74.9)	55 (25.1)
HBV can be found in the saliva of an infected person.	118 (53.9)	101 (46.1)
HB immunoglobulin can reduce the chances of infection after exposure to HBV.	153 (69.9)	66 (30.1)
A vaccinated person should not be considered as a possible source of infection	131 (59.8)	88 (40.2)
Some individuals will not produce antibodies to HBV after complete vaccination.	101 (46.1)	118 (53.9)

#### 4.3.3 Attitudes towards the prevention and control of HBV

The actual attitude scores of the respondents ranged from +2 to +9 with a mean of 7.36 (SD=1.61), a median of 7 and a mode of 9. The majority of the respondents (96.3% [211/219]) had positive attitudes and 3.7% (8/219) had neutral attitudes. None of the respondents had negative attitudes.

**Table 4.7 Distribution of attitudes of registered nurses**

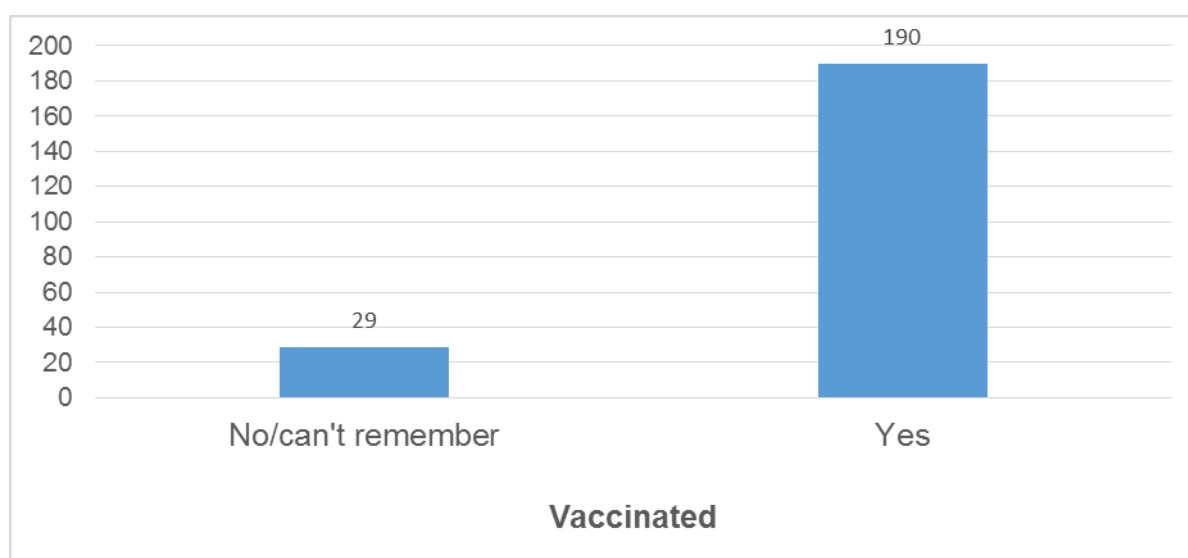
<b>Attitudes</b>	<b>Frequency</b>	<b>Percent</b>
Negative	0	0
Neutral	8	3.7
Positive	211	96.3
<b>Total</b>	<b>219</b>	<b>100</b>

**Table 4.8 Distribution of responses to attitude questions**

Attitude questions	Agree n (%)	Not sure n (%)	Disagree n (%)
HB vaccine should be given to HCWs as part of workplace safety.	216 (98.6)	0 (0)	3 (1.4)
I can agree to be tested for HBV infection.	214 (97.7)	0 (0)	5 (2.3)
Hepatitis B screening should be made compulsory.	182 (83.1)	19 (8.7)	18 (8.2)
My profession puts me at risk of HBV infection.	217 (98.6)	2 (0.9)	0 (0)
Biohazard waste should be segregated properly.	216 (98.6)	0 (0)	3 (1.4)
I always take health care standard precautions, therefore I am not at risk of HBV infection.	41 (18.7)	38 (17.4)	140 (63.9)
Due to the pressure of work, there is no time to go for vaccinations.	50 (22.8)	14 (6.4)	155 (70.8)
I can encourage a workmate to get vaccinated.	218 (99.5)	1 (0.5)	0 (0)
In emergency situations, I would rather attend to the patient first than delay looking for protective clothing like gloves.	24 (11.0)	2 (0.9)	193 (88.1)

#### 4.3.4 Vaccination status of registered nurses

Majority of the registered nurses (86.8% [190/219]) had received at least 1 dose of the HB vaccination series (Figure 4.2) and were regarded as vaccinated.

**Figure 4.2 Distribution of vaccination status of the registered nurses**

**Table 4.9 Cross tabulation between the vaccinated and clinical area of practice**

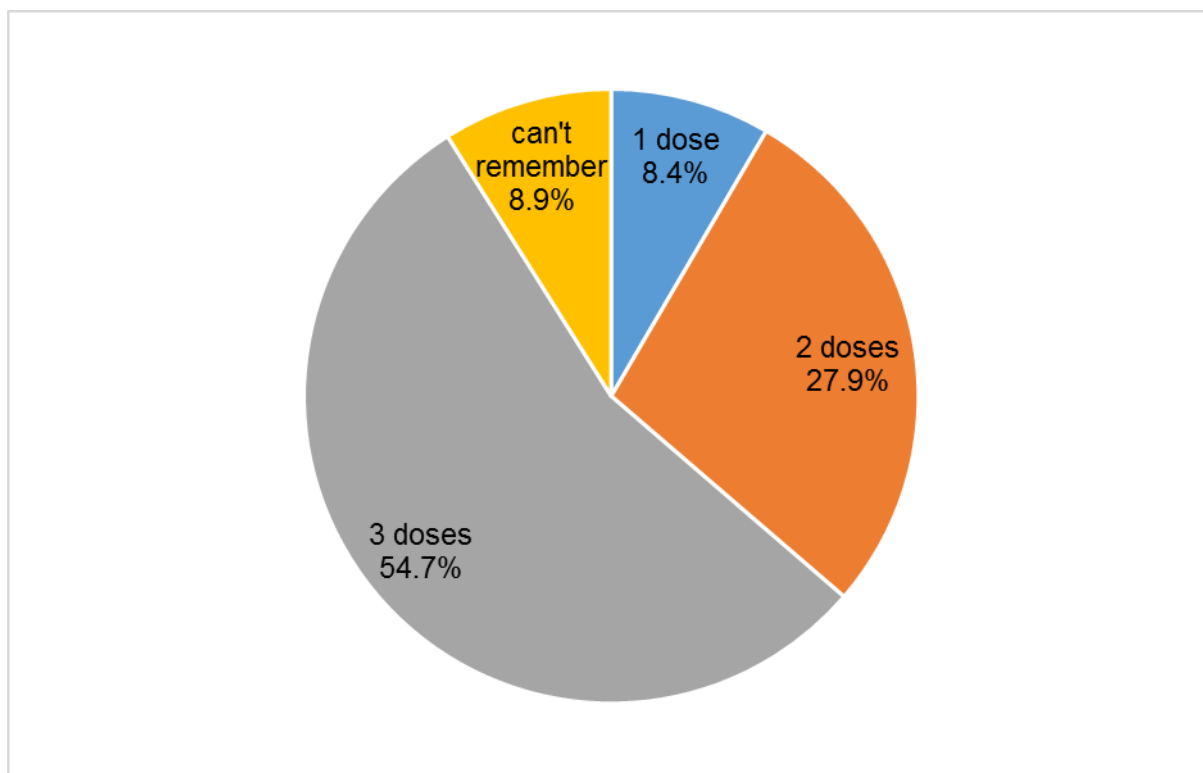
Clinical area of practice	Vaccinated	
	No/Can't remember n (%)	Yes n (%)
Maternity	11 (18.0)	50 (82.0)
Theatre	3 (17.6)	14 (82.4)
Medicine	4 (11.1)	32 (88.9)
Surgery	4 (11.4)	31 (88.6)
Intensive care	2 (7.1)	26 (92.9)
Emergency	3 (27.3)	8 (72.7)
Outpatient	0 (0)	21 (100)
Psychiatry	2 (20)	8 (80)
<b>Total</b>	<b>29 (13.2)</b>	<b>190 (86.8)</b>

**Table 4.10 Cross tabulation between attitude and being vaccinated**

Attitude	Vaccinated	
	No/Can't remember n (%)	Yes n (%)
Negative	0 (0)	0 (0)
Neutral	0 (0)	8 (100)
Positive	29 (13.7)	182 (86.3)
<b>Total</b>	<b>29 (13.2)</b>	<b>190 (86.8)</b>

**Table 4.11 Cross tabulation between knowledge and being vaccinated**

Knowledge	Vaccinated	
	No/Can't remember n (%)	Yes n (%)
Poor	2 (20.0)	8 (80.0)
Moderate	13 (14.0)	80 (86.0)
Good	14 (12.1)	102 (87.9)
<b>Total</b>	<b>29 (13.2)</b>	<b>190 (86.8)</b>



**Figure 4.3 Number of doses received by the registered nurses**

Some of the vaccinated registered nurses were tested to determine if they produced the requisite levels of antibodies for protection against HBV. Table 4.12 shows the results for the antibody test among the registered nurses who received 3 doses for complete HB vaccination.

**Table 4.12 Distribution of answers to antibody test and protection**

Question	No/Can't remember n (%)	Yes n (%)
Were you tested to establish if you have antibodies to hepatitis B (n=104)?	100 (96.2)	4 (3.8)
Are you protected against HBV infection (n=4)?	0 (0)	4 (100)

#### 4.3.5 Occupational exposures

The majority of registered nurses have either experienced a needlestick and sharps injury (51.6% [113/219]) or body fluid splash (56.6% [124/219]) as an occupational exposure at least once in their years of practice.

**Table 4.13 Distribution of answers to post-exposure management**

Exposure	Question	No/Can't remember n (%)	Yes n (%)
Needle-stick or sharps injury	Did you report the incident (n=113)	25 (22.1)	88 (77.9)
	Did you receive PEP for HBV (n=88)	55 (62.5)	33 (37.5)
Blood or body fluid splash	Did you report the incident (n=124)	46 (37.1)	78 (62.9)
	Did you receive PEP for HBV (n=78)	100 (80.6)	24 (19.4)

Among the exposed, only 37.5% (33/113) of those who had a needlestick and sharps injury, and 19.4% (24/124) of those who experienced body fluid splash received post-exposure prophylaxis against HBV.

#### 4.3.6 Associations between knowledge, attitudes and vaccination status

The independent variables, knowledge and attitudes were collapsed into dichotomous variables. Odds ratios were computed to determine and measure any associations between the independent variables and the dependent variable (vaccination status). Statistical significance of any association found was determined by the p-values of Chi-square and Fisher's exact tests. Fisher's exact p-value was used as the obtained dichotomous data for attitude did not meet the assumption that all cells should have expected counts greater than five. No statistically significant association was found (Table 4.14 and Table 4.15).

**Table 4.14 Association between knowledge and vaccination status**

Knowledge	Vaccinated		Odds ratio	Chi-square p-value
	No/Can't remember n (%)	Yes n (%)		
Moderate-poor	15 (51.7)	88 (46.3)	0.805	0.587
Good	14 (48.3)	102 (53.7)		
<b>Total</b>	<b>29 (100)</b>	<b>190 (100)</b>		

**Table 4.15 Association between attitudes and vaccination status**

Attitude	Vaccinated		Odds ratio	Fisher's exact p-value
	No/Can't remember n (%)	Yes n (%)		
Neutral-negative	0 (0)	8 (4.2)	Undefined	0.601
Positive	29 (100)	182 (95.8)		
<b>Total</b>	<b>29 (100)</b>	<b>190 (100)</b>		

#### 4.3.7 Factors predicting vaccination status

Binomial logistic regression was used to identify significant factors influencing vaccination uptake by the registered nurses. A positive attitude score was a significant factor influencing vaccination uptake (OR=1.424, p=0.003). Table 4.16 shows that respondents were 1.424 times more likely to vaccinate as their attitude score increased by 1. Among the demographic variables, gender was the only significant factor influencing vaccination uptake. The odds of being vaccinated was 3.479 times greater for females as opposed to males (Table 4.16). Chi-square test of independence was also conducted between demographic variables and vaccination status, and gender was the only variable significantly associated with vaccination status (Table 4.17).

**Table 4.16 Binomial logistic regression**

Variables	P-value	Odds ratio (OR)	95% CI for OR	
			Lower	Upper
Knowledge scores	0.253	1.136	0.913	1.414
Attitude scores	0.003	1.424	1.127	1.800
Gender	0.004	3.479	1.495	8.098

**Table 4.17 Cross tabulation between gender and vaccination status**

Gender	Vaccinated		Chi square P- value	Odds ratio (OR)	95% CI for OR	
	No/Can't remember n (%)	Yes n (%)			Lower	Upper
Male	15 (51.7)	50 (26.3)	0.005	3.000	1.352	6.655
Female	14 (48.3)	140 (73.7)				
<b>Total</b>	<b>29 (100)</b>	<b>190 (100)</b>				

The Independent samples (Student's) t-test (Table 4.18) was used to determine if there was a difference between the mean knowledge and attitude scores for the registered nurses who were vaccinated against those not vaccinated. For knowledge scores there

was no significant difference ( $p=0.239$ ). Nonetheless, the mean attitude score was significantly different ( $p=0.001$ ).

**Table 4.18 Comparison of knowledge and attitude scores**

Variables	Mean score		Mean difference	P-value	95% CI for OR	
	Vaccinated	Unvaccinated			Lower	Upper
Knowledge	7.65	7.21	-0.440	0.239	-1.176	0.295
Attitude	7.50	6.45	-1.052	0.001	-1.669	-0.435

#### 4.4 DISCUSSION AND INTERPRETATION OF RESULTS

Among any group of HCWs, one would anticipate a high level of knowledge regarding prevention and control of diseases. However, knowledge gaps still exist, especially among highly trained medical professionals. In this study, almost half of the registered nurses (47.1% [103/219]) had poor to moderate knowledge. On the other hand, none of the registered nurses had negative attitudes. As a matter of fact, the registered nurses had commendable positive attitudes especially regarding HB vaccination. This positive attitude significantly predicted the uptake of HB vaccination by the registered nurses. Despite commendable positive attitude in the majority, complete vaccination coverage was not satisfactory. Positive attitudes without the positive move will not preclude HBV entry into the HCWs. More females were vaccinated as compared to males, and gender was the only demographical variable significantly associated with HB vaccination status.

#### 4.5 SUMMARY

This chapter has presented the results of the study using tables, pie charts and graphs to summarise the data in numbers and percentages. The next chapter will give a more detailed discussion of the study findings presented in this chapter.



## **CHAPTER 5**

### **DISCUSSION, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

This chapter will give a detailed discussion of the findings of this study presented in Chapter 4. The findings addressed the research questions, and this discussion will generate conclusions and recommendations drawn from the interpretation of the findings.

#### **5.2 RESPONSE RATE**

Response rates are calculated by dividing the number of usable responses returned by the total number eligible in the sample chosen (Fincham 2008). An overall response rate of 73% was obtained in this study and this was acceptable as response rates approximating 60% for most researches should be the goal of researchers (Fincham 2008).

#### **5.3 KNOWLEDGE**

The majority of the registered nurses (53.0%) had good knowledge. A similar study conducted in Dhaka city Bangladesh on 300 nurses found that 67.3% of the respondents had adequate knowledge regarding HBV prevention (Mehriban, Ahsan & Islam 2014:50).

##### **5.3.1 Knowledge about the vaccine**

In this study, a vast majority of the registered nurses, 94.1% (206/219) knew about the availability of an effective and safe HBV vaccine. A similar finding was obtained in a study conducted in India (Amanpreet et al 2016:258). Results of this study showed that 69.9% of the respondents were aware that HB immunoglobulin reduces the possibility of infection after HBV exposure and this was in line with the findings of a study in Ethiopia

(Abeje & Azage 2015). Of the respondents in this study, 55.3% (121/219) knew that there is need to confirm immunity after complete vaccination, similar findings were obtained in two studies; one conducted in South Africa (Burnett, Francois, Mphahlele, Mureithi, Africa, Satekgea, Mokonoto, Meheus & Sprundel 2011:4295) and the other in Cameroon (Tatsilong et al 2016) among HCWs. However, the majority of the respondents, 53.9% (118/219) and 54.8% (120/219) did not know that after complete vaccination some individuals may not produce antibodies to HBV and that one or two doses (incomplete vaccination) do not give lifelong immunity to 90% of adults, respectively. These were unanticipated knowledge gaps taking into account their college training curriculum.

### **5.3.2 Knowledge about HBV transmission**

In this study, 59.8% (131/219) knew that a vaccinated person should be considered as a possible source of HBV infection. This is similar to the findings of the study conducted in South Africa among HCWs where 50.9% of the respondents knew the same (Burnett et al 2011:4295). About three-quarters of the registered nurses were aware that HBV is more infectious than HIV. Similarly, in South Western Nigeria, the majority of the HCWs (87.1%) were of the opinion that hepatitis B virus is about 100 times more infectious than HIV (Akpore & Akingbehin 2017). 46.1% of the registered nurses did not know that HBV can be found in the saliva of an infected person. A study conducted among nurses in Dhaka, Bangladesh revealed a comparable finding where more than half (52.9%) stated that it cannot be transmitted through saliva (Khan, Riya, Islam & Majeed 2017:38). The majority (90.1% [199/219]) knew that an infected HCW can transmit HBV to patients. Similarly, this was found in a study conducted in Kuwait where the HCWs knew the same (Habiba, Ghadeer, Alrashidi, Al-otaibi, Almutairi, Makboul & El-Shazly 2012:78).

## **5.4 ATTITUDES**

The majority of the registered nurses 96.3% (211/219) had positive attitudes. A similar finding was discovered in the Gaborone study, where 97.4% (114/117) of the respondents had positive attitudes (Machiya et al 2015:256).

#### **5.4.1 Attitudes towards HB vaccination**

Majority of the registered nurses 98.6% in this study agreed that HBV vaccine should be given to HCWs as part of workplace safety, this was consistent with the findings of a study conducted in Ethiopia where 91.7% had a similar opinion (Abeje & Azage 2015). Only 1.4% (3/219) of the registered nurses in this study disagreed. Almost all the registered nurses (99.5% [218/219]) in this study agreed they can encourage a workmate to get vaccinated. A similar finding was reported in a study conducted in Cameroon study where 93% felt that the vaccine should be compulsory and all (100%) were willing to recommend it to others (Tatsilong et al 2016). In this study, a majority of the registered nurses (70.8% [155/219]) disagreed to the statement “Due to pressure of work, there is no time to go for vaccinations” indicating that vaccination uptake can never be deterred by their busy schedules as cited by HCWs in other studies as reasons for non-compliance to vaccination.

#### **5.4.2 Attitude towards risk of occupational exposure**

The majority (63.9% [140/219]) of the registered nurses disagreed to the statement “I always take health care standard precautions, therefore I am not at risk of HBV infection”. Similarly, 79.5% (128/161) of HCWs disagreed to the same statement in a study done in South Africa (Burnett et al 2011:4295). This shows that the registered nurses acknowledge the fact that standard precautions can reduce but do not eliminate the risk of HBV infection. 98.6% (217/219) of the respondents in this study concurred that their work exposes them to HBV infection, and this is consistent to the findings of the study conducted in India (Amanpreet et al 2016:258).

In this study, 83.1% (182/219) of the registered nurses agreed that HBV screening should be made compulsory. In addition, 97.7% (217/219) indicated they can agree to be tested for HBV. This shows they fully acknowledge the magnitude of HBV infection as an occupational hazard, and that a HCW, if infected, is at risk of transmitting HBV to patients even though published cases of HBV transmission from HCW to the patient are relatively rare (Lewis et al 2015:488). A study in Tanzania revealed an overall prevalence of chronic HBV infection (HBsAg positivity) among HCWs of 7.0%, and that 36.5% of HCWs achieved immunity due to healed infection with HBV (Mueller et al

2015). This further emphasises that HCWs have a high risk of becoming infected with HBV through their occupation.

## **5.5 VACCINATION STATUS**

Majority of the registered nurses (86.8% [190/219]) had received at least one dose of the HB vaccination series. This finding is much better compared to that of the study conducted in Gaborone where only 50.9% (59/116) of the HCWs had received at least one dose (Machiya et al 2015:256). Among the vaccinated registered nurses in this study, 54.7% (104/190) had received all the 3 doses for complete vaccination, in a similar fashion, 61% (36/59) of the HCWs in the Gaborone study had received the complete 3 dose series (Machiya et al 2015:256). On the contrary, one Ethiopian study had only 10% of the respondents who reported that they had received one or more doses of the hepatitis B vaccine (Abeje & Azage 2015).

It is imperative that all HCWs should have serologic testing 1-2 months following the final dose of the hepatitis B vaccine series (Health Protection Surveillance Centre 2016). An anti-HBs serologic test result of >10mIU/ml indicates immunity, otherwise, the HCW is susceptible to HBV infection. Only 4.2% (8/190) of those vaccinated in this study had their immunity checked and 50% (4/8) of those (whose immunity was checked) were protected against HBV. This is in contrast to the study done in South Africa where it was found that 27.6% (32/116) had their immunity checked and 93.75% (30/32) stated they were protected (Burnett et al 2011:4296). In this study, only 2.1% (4/190) of the vaccinated registered nurses were confirmed to be protected. This suggests that 97.9% (186/190) of the registered nurses may still be susceptible to HBV infection. The study in Tanzania also revealed that immunity (anti-HBs positivity) was present in 56.9 % of the HCWs but 31.3 % of them were still susceptible to HBV infection as shown by anti-HBs levels below 10mIU/ml (Mueller et al 2015).

The majority of the registered nurses had experienced either a needle-stick injury (51.6% [113/219]) or body fluid splash (56.6% [124/219]) as exposure at least once during their career. This finding is comparable to an Iranian study where 57% of nurses reported a history of NSI (Farahnaz, Fitorz, Mohammad & Tolou 2017:36). In this study, the majority (77.9% [88/113]) of the registered nurses exposed through a needle-stick or sharps injury reported the incident, but surprisingly, only 37.5% (33/88) of those who

reported received PEP for HBV. Considering that only 2.1% of the registered nurses were protected against HBV, a higher proportion, if not all, of those who reported exposure incidents should have received PEP. Similarly, in another South African study, a small proportion (8.7%) of medical practitioners received prophylactic hepatitis B immunoglobulin after exposure (De Villiers et al 2007:14). Importance of vaccination is demonstrated in this South African study as two exposed medical practitioners seroconverted to HBV positivity, and in both cases, neither was vaccinated against HBV infection prior to exposure (De Villiers et al 2007:14).

## **5.6 ASSOCIATION**

No statistically significant associations were observed between knowledge, attitudes and vaccination status. These associations were tested using the Chi-square test of association. Among the demographical variables, gender was the only variable significantly associated with vaccination status ( $p=0.005$ ).

## **5.7 PREDICTORS OF VACCINE UPTAKE**

Positive attitude and being a female were predictors of HB vaccination uptake by the registered nurses in this study. Majority of the respondents had a positive attitude and the findings showed that a positive attitude significantly predicted HB vaccination uptake. This was compatible with the findings of the South African study in which a positive attitude significantly predicted HB vaccine uptake among HCWs (Burnett et al 2011:4296).

In this study, the level of knowledge was not a predictor of vaccine uptake. This is in contrast to the findings of an Ethiopian study conducted amongst nurses where the level of knowledge towards hepatitis B vaccination was one of the most important predictors of vaccination status (Yimer et al 2017).

In this study, gender was a significant predictor of vaccination uptake. The likelihood of being vaccinated was 3.479 times greater in female registered nurses than male registered nurses. A study conducted among high-risk public safety workers in Nigeria revealed a comparable finding where women were associated with about twice the

likelihood of having received full dose HB vaccination as compared to men (Ochu & Beynon 2017).

## **5.8 CONCLUSION**

Despite the majority having good knowledge, registered nurses showed a lack of requisite knowledge regarding HB prevention and control. Knowledge gives the power to judge situations and make decisions voluntarily. Knowledge gaps were identified in HB vaccine efficacy and transmission routes like saliva. Complete HB vaccination uptake is one of the best decisions a registered nurse should ever make during his/her practice. Not all registered nurses received the 3 dose series for complete vaccination, and only a few of those fully vaccinated were protected against HBV infection. It is possible that a significant number of registered nurses at Nyangabgwe Hospital may still be susceptible to HBV infection. There is an urgent need to safeguard the registered nurses and other HCWs with complete HB vaccination, especially considering that majority of the registered nurses reported the incidents of exposure but only a few received PEP.

Although efforts to initiate the HB vaccination series are relatively high among the registered nurses, complete vaccination coverage still remains low considering the occupational risk they are exposed to. At Nyangabgwe hospital, the HB vaccine is given to all HCWs for free unlike in other studies where the cost of the hepatitis B vaccine has been documented as a significant barrier to the uptake of the vaccine among HCWs. Since positive attitude was a significant predictor of vaccine uptake, erratic availability of the HB vaccine at the hospital may be a possible barrier for vaccination uptake.

## **5.9 RECOMMENDATIONS**

### **5.9.1 Recommendations for clinical practice**

The Botswana Ministry of Health and Wellness should develop, implement and strengthen occupational safety and health policies. Such policies should include a hepatitis B prevention and control policy that ensures a consistent supply of the HB vaccine to all the health facilities, and compulsory HB screening and vaccination among HCWs.

A post-vaccination test for immunity after complete vaccination should be mandatory as part of the HB vaccination programme. This also helps to identify non-responders to HB vaccination.

### **5.9.2 Recommendations for health education**

The study has shown that a number of exposure incidents are not reported. Underreporting results in underestimates of adequate statistics that prompt the infection control managers to enact and review public health policies and strategies. Guidelines and principles of post-exposure management should be implemented and adhered to on all exposure incidents. The hospital infection control programmes should include effective educational training to improve the dissemination of HBV knowledge and encourage hepatitis B vaccination uptake among all HCWs.

### **5.9.3 Recommendations for further research**

The study has demonstrated that complete vaccine uptake still remains low among HCWs. This study finding can form a strong basis for recommended future studies which include: a study to ascertain nurses' perception of HB vaccination and subjective reasons for poor compliance of vaccine uptake; a quantitative seroprevalence study to determine the actual immune status of nurses (and other HCWs) at Nyangabgwe hospital and estimate the prevalence of HBV in this study group for appropriate intervention.

## **5.10 LIMITATIONS OF THE STUDY**

In spite of the study being relatively cheap and easy to conduct, there is a possibility of recall bias on the self-reported vaccination status, the number of HB vaccine doses received, exposure incidents and post-vaccination testing for immunity. Those respondents previously exposed to HBV could have remembered more information about HBV than those never exposed. The study might have also been affected by volunteer bias; responses may have been higher in respondents with good knowledge and positive attitudes compared to those with poor knowledge yet positive attitudes. The study might have suffered sampling bias, especially where it was difficult to locate some

registered nurses who were randomly selected to participate due to annual, sick and study leaves, and outreach programmes of the hospital.

### **5.11 CONCLUDING REMARKS**

Hepatitis B can be prevented, diagnosed, treated and even cured. While testing and treatment are key to eliminating hepatitis, a strong focus on prevention is required to achieve the goal to eliminate hepatitis by 2030 (WHO 2018). The study has shown that registered nurses and other HCWs are aware of the preventive practices regarding control of hepatitis B, but as long as they are not completely vaccinated and tested to ensure they have achieved a protective level of antibodies against HBV, they still remain at risk of HBV infection. It is the responsibility of every HCW to adequately conform to all the preventive measures to ensure the least possible risk of contracting the infection from HBV and other blood-borne viruses.



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## **ANNEXURES**

## ANNEXURE A

### Unisa Ethical Clearance



#### RESEARCH ETHICS COMMITTEE: DEPARTMENT OF HEALTH STUDIES

REC-012714-039 (NHERC)

6 December 2017

Dear Leighton Taurai Kapungumber

**Decision: Ethics Approval**

**HS HDC/816/2017**

Leighton Taurai Kapungumber

Student No.: 4944-961-3

Supervisor: Prof TSB Mokoboto Zwane

Qualification: D Litt et Phil

Joint Supervisor:

**Name:** Leighton Taurai Kapungumber

**Proposal:** Hepatitis B Prevention and control: knowledge, attitudes and vaccination status of nurses in Botswana

**Qualification:** MPCHS94

Thank you for the application for research ethics approval from the Research Ethics Committee: Department of Health Studies, for the above mentioned research. Final approval is granted from 6 December 2017 to 6 December 2019

*The application was reviewed in compliance with the Unisa Policy on Research Ethics by the Research Ethics Committee: Department of Health Studies on. 6 December 2017*

*The proposed research may now commence with the proviso that:*

- 1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
- 2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Research Ethics Review Committee, Department of Health Studies. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*



University of South Africa  
Pretorius Street, Muckleneuk Ridge, City of Tshwane  
PO Box 392 UNISA 0003 South Africa  
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150  
[www.unisa.ac.za](http://www.unisa.ac.za)

3) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.

4) [Stipulate any reporting requirements if applicable].


Note:

The reference numbers [top middle and right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the Research Ethics Committee: Department of Health Studies.

Kind regards,



Prof JE Maritz  
CHAIRPERSON  
[maritje@unisa.ac.za](mailto:maritje@unisa.ac.za)

  
To Prof MM Moleki  
ACADEMIC CHAIRPERSON  
[molekmm@unisa.ac.za](mailto:molekmm@unisa.ac.za)



Prof A Phillips  
DEAN COLLEGE OF HUMAN SCIENCES

Approval template 2014

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## **ANNEXURE B**

### **Permission requested to do the study**

23 February 2018

Nyangabgwe Hospital Laboratory  
Private Bag 127  
Francistown

The Chairperson  
Research Ethics Committee  
Nyangabgwe Hospital  
P. Bag 127  
Francistown

Dear Sir/Madam

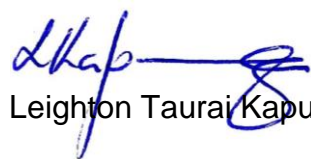
### **RE: APPLICATION TO CONDUCT RESEARCH**

This letter serves as an application to conduct a research at Nyangabgwe Hospital. I am a student in the School of Public Health, University of South Africa for the Master of Public Health programme where a research report is mandatory to fulfil the requirements of the programme.

Find enclosed the approval for the intended research from the MoHW, the research proposal, the questionnaire (data collection tool) and the consent form. Should you have any questions concerning the study, please do not hesitate to contact the researcher on 74185290 / 2411353 or the research supervisor, Dr TSB Mokoboto-Zwane on +2712 4293111.

I look forward to your most favourable response.

Yours faithfully



Leighton Taurai Kapungumberi

## ANNEXURE C

### Approval from MOHW

PRIVATE BAG 0038  
GABORONE  
BOTSWANA  
REFERENCE:



REPUBLIC OF BOTSWANA  
MINISTRY OF HEALTH AND WELLNESS

TEL: (+267) 363 2500  
FAX: (+267) 391 0647  
TELEGRAMS: RABONGAK  
TELEX: 2818 CARE BD

REFERENCE NO: HPDME 13/18/1

13 December 2017

#### Health Research Development Committee

Principal Investigator: Mr Leighton Taurai  
Notification of IRB Review: Continuing Review

Protocol Title: HEPATITIS B PREVENTION AND CONTROL: KNOWLEDGE, ATTITUDE AND VACCINATION STATUS OF NURSES AT NYANGABGWE HOSPITAL IN FRANCISTOWN, BOTSWANA

Review Type: Health Research Development Committee  
Effective Date: 13 December 2017  
Expiration Date: 12 December 2018

This certifies that the continuing review request for the protocol above was reviewed under review procedures. Approval is valid for a period of 1 year.

- ☒ Study is continuing.
- ☐ The study has not been activated.
- ☐ Open to Enrollment.
- ☐ Accrual complete with treatment intervention and /or participant interviews/ surveys continuing.
- ☒ Open for analysis only. Expected end date: 30.11.2018
- ☐ Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior).
- ☐ Other, Please describe:
- ☐ Research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

If you have any questions please do not hesitate to contact Ms Seeletso Mosweunyane at [smosweunyane@gov.bw](mailto:smosweunyane@gov.bw), Tel: +267 3632018 and Mr. K. Motlhanka at [kmmotlhanka@gov.bw](mailto:kmmotlhanka@gov.bw), Tel +267-3632751. Thank you for your cooperation and your commitment to the protection of human subjects in research.

Yours sincerely

Ms S. Mosweunyane

for **/PERMANENT SECRETARY**



Vision: A Healthy Nation by 2036.

Values: Botho, Equity, Imelliness, Customer Focus, Teamwork, Accountability



## ANNEXURE D

### Approval from the institution (Nyangabgwe Hospital)

TELEPHONE: 2411000 ext 180

FAX : 2416706/2419387



Republic of Botswana

NYANGABGWE HOSPITAL

PRIVATE BAG 127

FRANCISTOWN

BOTSWANA

REF: NH/I/2/17 IV (18)

19 March 2018

**Ethical Review of Proposed Study: Hepatitis B Prevention And Control: Knowledge, Attitude And Vaccination Status Of Nurses At Nyangabgwe Hospital In Francistown, Botswana.**

**Name of Applicant** Mr Leighton Taurai

**Name of Site** : Nyangabgwe Referral Hospital

**Decision** : 15 March 2018

**Expiration Date** : 12 December 2018

The Institutional Review Board (Research & Ethics Committee) for Human Subjects Research for Nyangabgwe Hospital is pleased to inform you that the research protocol named above was approved.

The study involves data collection from Nyangabgwe Hospital and involves no more than minimal risk. It is a non therapeutic research and does not involve the use of devices for which there is limited knowledge. The protection of data collection protection has been outlined.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Hospital Research and Ethics Committee. In addition you are expected to submit at least one hard copy and an electronic copy of the report to the committee within three months of completion of the study.

Signed.....

Bayengemali R. Munyere

Chairperson- Research and Ethics Committee

**For Hospital Superintendent**

**Nyangabgwe Referral Hospital**

## ANNEXURE E

### Questionnaire (for registered nurses)

Research title: Hepatitis B prevention and control: Knowledge, attitudes and vaccination status of registered nurses at Nyangabgwe Hospital in Francistown, Botswana.

Please answer the following questions by placing a tick (✓) in the box that corresponds to the answer. If you make a mistake cancel by making a straight line across the tick (✓) and tick the correct answer. For question 1, write your age.

#### Section A

1. Age (years) \_\_\_\_\_

2. Gender

Male	
Female	

3. Highest level of education

Diploma	Degree	Masters

4. Clinical area of practice (workstation)

Maternity	Theatre	Medicine	Surgery	Intensive care	Emergency	Outpatient	Psychiatry

5. Years in profession

< 5	5-9	10-14	15-19	>20

#### Section B

6. Health care workers (HCWs) who are carriers of hepatitis B virus (HBV) can transmit the infection to patients.

Yes	No	Don't know



7. An infected person can be asymptomatic for a long time

Yes	No	Don't know

8. HBV infection can be prevented by a safe and effective vaccine.

Yes	No	Don't know

9. One or two doses of HBV vaccine give lifelong immunity to 90% of adults.

Yes	No	Don't know

10. After vaccination for hepatitis B, there is no need for a blood test to confirm immunity against hepatitis B.

Yes	No	Don't know

11. HBV can be spread through contact with open wounds.

Yes	No	Don't know

12. HBV is more infectious than HIV.

Yes	No	Don't know

13. HBV can be found in the saliva of an infected person.

Yes	No	Don't know

14. Hepatitis B immunoglobulin can reduce chances of infection after exposure to HBV.

Yes	No	Don't know

15. A person vaccinated against hepatitis B should not be considered as a possible source of hepatitis B.

Yes	No	Don't know

16. Some individuals will not produce antibodies to HBV after complete vaccination.

Yes	No	Don't know

### Section C

17. HBV vaccine should be given to Health Care Workers as part of workplace safety.

Agree	Disagree	Not sure

18. I can agree to be tested for HBV infection.

Agree	Disagree	Not sure

19. Hepatitis B screening should be made compulsory.

Agree	Disagree	Not sure

20. My profession puts me at risk of HBV infection

Agree	Disagree	Not sure

21. Biohazard waste should be segregated properly.

Agree	Disagree	Not sure

22. I always take health care standard precautions, therefore I am not at risk of HBV infection.

Agree	Disagree	Not sure

23. Due to the pressure of work, there is no time to go for vaccinations.

Agree	Disagree	Not sure

24. I can encourage a workmate to get vaccinated.

Agree	Disagree	Not sure

25. In emergency situations, I would rather attend to the patient first than delay looking for protective clothing like gloves.

Agree	Disagree	Not sure

#### Section D

26. Have you ever been vaccinated against HBV infection?

Yes	No	Can't remember

**Please complete 27-35 only if your answer to 26 is 'yes'**

27. How many doses did you receive?

1	2	3	Can't remember

28. Were you tested to establish if you have antibodies to hepatitis B?

Yes	No	Can't remember

29. If you were tested, are you protected against HBV infection?

Yes	No	Can't remember

30. Is there a valid documentation to show that you were vaccinated?

Yes	No	Can't remember

31. The vaccine caused mild side effects.

Yes	No	Can't remember

## Section E

32. Have you ever had a contaminated needle stick or sharps injury?

Yes	No	Can't remember

33. Have you ever experienced patient's blood or body fluids splashing into your face?

Yes	No	Can't remember

**Please complete 34-35 only if your answer to 32 and/or 33 is 'yes'**

34. Did you report the incident?

Yes	No	Can't remember

35. Did you receive any post-exposure prophylaxis against HBV infection?

Yes	No	Can't remember

## **ANNEXURE F**

### **Consent form**

#### **Title of the Study**

Hepatitis B prevention and control: knowledge, attitudes and vaccination status of nurses in Botswana.

#### **Introduction**

Nurses contribute the largest proportion of health care workers and their general knowledge and attitudes regarding the prevention of communicable diseases have a direct impact on the goals of public health. Occupational exposures are common within health facilities putting both nurses and patients at risk of infections. It is therefore important to evaluate how well informed and protected nurses are, regarding HBV infection and proper patient care.

#### **Purpose of the study**

The objectives of the study is to determine the knowledge, attitudes and vaccination status of nurses regarding the prevention and control of hepatitis B at Nyangabgwe Hospital. The study will also determine the factors predicting the uptake of hepatitis B vaccination by the registered nurses.

#### **Eligibility criteria**

***Inclusion criteria*** – All registered nurses whose duties directly or indirectly expose them to the risk of HBV infection.

***Exclusion criteria*** – All registered nurses whose duties do not expose them to the risk of HBV infection.

#### **Risks and/or discomfort**

The anticipated discomfort may be disclosure of information regarded as poor knowledge or poor attitudes.

#### **Benefits**

The study results may help improve and strengthen the Hospital infection control and occupational safety measures towards risk of exposure to hepatitis B.

#### **Compensation**

No cost will be incurred by the respondents, neither will there be compensation nor incentives.

#### **Voluntary participation and right to withdraw**

Participation is entirely voluntary, should respondents wish to withdraw from participation, they are free to do so and they will not be held accountable.

## Privacy, anonymity and confidentiality

Privacy and anonymity of respondents will be assured. The respondents' right to privacy will be protected by ensuring the confidentiality of the collected data. Anonymous questionnaires will be distributed to the respondents. No respondent's identification information will be captured by the questionnaire. All the collected information will be destroyed upon completion of the study. The results of the study will be availed to Nyangabgwe Hospital Research committee, Ministry of Health Botswana and the University of South Africa.

## Contact details

For more information regarding the research, please feel free to contact:

The Researcher – Mr Leighton Taurai Kapungumberi

Tel 2411353, Mobile 74185290/ 72114091

or

The Research supervisor – Prof TSB Mokoboto-Zwane

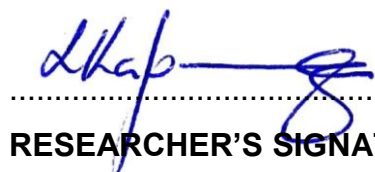
Tel +2712 4293111

## Statement by respondent

- I have had the research satisfactorily explained to me in verbal and/or written form by the researcher.
- I understand that participation in the research will involve completing a questionnaire that I have to fill on my own.
- I understand that I may withdraw from this study at any time without having to give an explanation or face consequences.
- I understand that all the information about me will be treated in strict confidence and that I will not be named in any written work arising from this study.
- I understand that questionnaires will be used solely for research purposes and will be destroyed upon completion of the study.
- I have seen the approval documents for this study from the relevant authorities of UNISA, Ministry of Health and Wellness, and Nyangabgwe Hospital.

Name of respondent.....

Signature..... Date.....



..... Date.....

**RESEARCHER'S SIGNATURE**

Leighton Taurai Kapungumberi

## ANNEXURE G

### Statistician's letter

18 Baltimore Rd  
Avonlea  
Harare

10 September 2018

The Chairperson  
College of Human Sciences  
Department of Health Studies  
University of South Africa

Dear Sir/Madam

**RE: STUDY RESULTS FOR MR KAPUNGUMBERI**

This letter serves to endorse the study results of Mr Kapungumberi. He used self-reporting as a method of data collection and the data collection tool was a questionnaire. The data was coded and I did the statistical analysis using SPSS version 22.

The statistical tests used included Chi-square, Student's t test and Binomial logistic regression.

Should you require any additional information, don't hesitate to contact me.

Yours faithfully,



Artmore Muguse  
Email: artmore.muguse@gmail.com  
Cell: +263 772 645 904  
Skype: Artmore\_Muguse

## ANNEXURE H

### English language editor's letter

4 Kellar Court  
Cnr Prince Edward/Fife Avenue  
Harare  
Zimbabwe

12 December 2018

The Chairperson  
College of Human Sciences  
Department of Health Studies  
University of South Africa

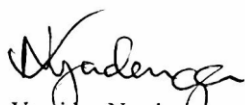
Dear Sir/Madam

**RE: LANGUAGE EDITING FOR MR KAPUNGUMBERI'S DISSERTATION**

This is to confirm that I have edited Mr Kapungumberi's dissertation with regards to the English language. The editing was achieved through proofreading to correct all the English language errors, and improve clarity and overall sentence structure.

Should you require further clarification, don't hesitate to contact me on the details below.

Yours faithfully,



Varaidzo Nyadenga  
Email: nyadenga.varaidzo@gmail.com  
Cell: +263 772 326 393 / +263 712 003 300



## **ANNEXURE I**

### **Turnitin originality report**

**thesis rev3**

*by* Leighton Taurai Kapungumberi

**Submission date:** 14-Jan-2019 01:31PM (UTC+0200)

**Submission ID:** 1063936236

**File name:** Leighton\_submit\_exam\_5\_Jan\_2019.doc (4.37M)

**Word count:** 16975

**Character count:** 106360

# thesis rev3

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